

# **Side activity report JCTVC-T0140**

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# Items

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- a) Report whether the PSNR between components is becoming more unbalanced;**
- b) Report whether YCoCr is more frequently used;**
- c) Report whether local PSNR becomes different dependent on ACT choice;**
- d) Perform visual inspection; and**
- e) Clarify whether lambda setting has been adjusted depending on the QP offset change.**

# Recapitulation of JCTVC-T0140 test2 setting

## CTC Anchor



## Test2 Anchor



Test2 Proposal (is to set different QP offset values between different color spaces.)



# Recapitulation of JCTVC-T0140 test2 results

Proposal showed significant gain in G component, especially in camera captured sequence.

	All Intra		
	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-10.3%	2.4%	2.6%
RGB, mixed content, 1440p & 1080p	-9.8%	4.8%	5.4%
RGB, Animation, 720p	-12.9%	10.7%	9.0%
RGB, camera captured, 1080p	-37.9%	9.7%	2.9%
YUV, text & graphics with motion, 1080p & 720p	NA	NA	NA
YUV, mixed content, 1440p & 1080p	NA	NA	NA
YUV, Animation, 720p	NA	NA	NA
YUV, camera captured, 1080p	NA	NA	NA
Enc Time[%]	97%		
Dec Time[%]	97%		

	Random Access		
	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-12.8%	4.1%	4.2%
RGB, mixed content, 1440p & 1080p	-20.2%	5.1%	5.6%
RGB, Animation, 720p	-19.8%	9.0%	8.9%
RGB, camera captured, 1080p	-37.0%	7.0%	-3.4%
YUV, text & graphics with motion, 1080p & 720p	NA	NA	NA
YUV, mixed content, 1440p & 1080p	NA	NA	NA
YUV, Animation, 720p	NA	NA	NA
YUV, camera captured, 1080p	NA	NA	NA
Enc Time[%]	95%		
Dec Time[%]	97%		

	Low delay B		
	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-11.8%	6.3%	6.1%
RGB, mixed content, 1440p & 1080p	-21.1%	8.2%	8.8%
RGB, Animation, 720p	-24.3%	16.3%	17.4%
RGB, camera captured, 1080p	-43.0%	13.7%	1.8%
YUV, text & graphics with motion, 1080p & 720p	NA	NA	NA
YUV, mixed content, 1440p & 1080p	NA	NA	NA
YUV, Animation, 720p	NA	NA	NA
YUV, camera captured, 1080p	NA	NA	NA
Enc Time[%]	95%		
Dec Time[%]	97%		

# Selection of reprehensive results

	All Intra		
	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-10.3%	2.4%	2.6%
RGB, mixed content, 1440p & 1080p	-9.8%	4.8%	5.4%
RGB, Animation, 720p	-12.9%	10.7%	9.0%
RGB, camera captured, 1080p	-37.9%	9.7%	2.9%
YUV, text & graphics with motion, 1080p & 720p	NA	NA	NA
YUV, mixed content, 1440p & 1080p	NA	NA	NA
YUV, Animation, 720p	NA	NA	NA
YUV, camera captured, 1080p	NA	NA	NA
Enc Time[%]	97%		
Dec Time[%]	97%		

	Random Access		
	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-12.8%	4.1%	4.2%
RGB, mixed content, 1440p & 1080p	-20.2%	5.1%	5.6%
RGB, Animation, 720p	-19.8%	9.0%	8.9%
RGB, camera captured, 1080p	-37.0%	7.0%	-3.4%
YUV, text & graphics with motion, 1080p & 720p	NA	NA	NA
YUV, mixed content, 1440p & 1080p	NA	NA	NA
YUV, Animation, 720p	NA	NA	NA
YUV, camera captured, 1080p	NA	NA	NA
Enc Time[%]	95%		
Dec Time[%]	97%		

Kimono results are selected since gain is higher than that of EBU Rain Fruit.

## Low delay B

RGB, camera captured, 1080p	EBURainFruits_1920x1080_50_10bit_444												
			22	27	32	37	25174.86	43.34	40.21	43.68	-20.73%	4.05%	3.55%
				15068.80	41.16	39.28	10230.12	40.99	38.35	41.24			
				6082.71	39.00	37.16	4602.37	38.36	36.29	38.58			
				2844.93	36.28	34.97	2229.60	35.52	34.06	35.78			
	Kimono1_1920x1080_24_10bit_444		22	118344.81	40.29	41.21	34741.41	40.17	34.63	38.61	-53.31%	9.91%	-10.42%
			27	31328.88	39.15	34.59	8362.77	38.94	32.57	37.18			
			32	7310.60	37.85	32.52	2721.34	37.37	31.89	35.60			
			37	1794.48	36.16	31.63	1317.19	35.40	31.16	33.72			
Dec Time[%]	97%												

## Item a) PSNR between components is becoming more unbalanced?

### ■ No.

- Test2 Anchor QP=22 becomes balanced.
- Except this, balance looks somewhat consistent.

	QP	Rate Kbps	PSNR dB			PSNR ratio		
			G	B	R	G/G	B/G	R/G
CTC Anchor	22	36759.9	40.40	34.96	38.79	1.00	0.87	0.96
	27	8282.3	39.18	32.62	37.37	1.00	0.81	0.93
	32	2526.1	37.57	31.92	35.69	1.00	0.85	0.95
	37	1134.9	35.35	31.05	33.52	1.00	0.88	0.95
Test2 Anchor	22	118344.8	40.29	41.21	41.01	1.00	1.02	1.02
	27	31328.9	39.15	34.59	38.53	1.00	0.86	0.95
	32	7310.6	37.85	32.52	36.83	1.00	0.86	0.97
	37	1794.5	36.16	31.63	34.83	1.00	0.87	0.96
Test2 Proposal	22	34741.4	40.17	34.63	38.61	1.00	0.86	0.96
	27	8362.8	38.94	32.57	37.18	1.00	0.81	0.92
	32	2721.3	37.37	31.89	35.6	1.00	0.85	0.95
	37	1317.2	35.4	31.16	33.72	1.00	0.88	0.95

## Item b) YCoCr is more frequently used?

- YCoCr coded area is drastically changed by use of qp offset.

	QP	Rate Kbps	PSNR dB			YCoCr area ratio %
			G	B	R	
CTC Anchor	22	36759.9	40.40	34.96	38.79	26.15
	27	8282.3	39.18	32.62	37.37	38.52
	32	2526.1	37.57	31.92	35.69	32.97
	37	1134.9	35.35	31.05	33.52	20.13
Test2 Anchor	22	118344.8	40.29	41.21	41.01	0.79
	27	31328.9	39.15	34.59	38.53	19.61
	32	7310.6	37.85	32.52	36.83	29.73
	37	1794.5	36.16	31.63	34.83	27.54
Test2 Proposal	22	34741.4	40.17	34.63	38.61	0.71
	27	8362.8	38.94	32.57	37.18	9.54
	32	2721.3	37.37	31.89	35.6	14.86
	37	1317.2	35.4	31.16	33.72	15.21

## Item c) Local PSNR becomes different dependent on ACT choice?

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- Discovered that this investigation is not possible by using the current simulation results.
  - Local PSNR can become different depend on the other factors, such as, intra/inter/skip decision, cross residual correlation, etc.



## Item d) Visual inspection

■ Visual difference was not observed at high QP.

	QP	Rate Kbps	PSNR dB		
			G	B	R
CTC Anchor	22	36759.9	40.40	34.96	38.79
	27	8282.3	39.18	32.62	37.37
	32	2526.1	37.57	31.92	35.69
	37	1134.9	35.35	31.05	33.52
Test2 Anchor	22	118344.8	40.29	41.21	41.01
	27	31328.9	39.15	34.59	38.53
	32	7310.6	37.85	32.52	36.83
	36	2373.8	36.48	31.79	35.31
	37	1794.5	36.16	31.63	34.83
	39	1200.7	35.29	31.25	33.87
Test2 Proposal	22	34741.4	40.17	34.63	38.61
	27	8362.8	38.94	32.57	37.18
	32	2721.3	37.37	31.89	35.6
	37	1317.2	35.40	31.16	33.72

The following slides show the screen shots the low, middle, and high QP results that are coded by similar bitrates.

**Item d) CTC Anchor with low QP**  
**36759Kbps, G 40.40 dB, B 34.96 dB, R 38.79dB**



**Item d) Test2 Anchor with low QP**  
**31328Kbps, G 39.15 dB, B 34.59 dB, R 38.53dB**





## Item d) Test2 Proposal with low QP

34741Kbps, G 40.17dB, B 34.63 dB, R 38.61dB



**Item d) CTC Anchor with middle QP**  
**2526Kbps, G 37.57 dB, B 31.92 dB, R 35.69dB**





**Item d) Test2 Anchor with middle QP**  
**2373Kbps, G 36.48 dB, B 31.79 dB, R 35.31dB**



**Item d) Test2 Proposal with middle QP**  
**2721Kbps, G 37.37 dB, B 31.89 dB, R 35.60dB**





**Item d) CTC Anchor with high QP**  
**1135Kbps, G 35.35 dB, B 31.05 dB, R 33.52 dB**





**Item d) Test2 Anchor with high QP**  
**1200 Kbps, G 35.29 dB, B 31.25 dB, R 33.87 dB**



## Item d) Test2 Proposal with high QP 1317Kbps, G 35.40 dB, B 31.16 dB, R 33.72 dB



## Item e) Lambda setting has been adjusted depending on the QP offset change?

■ Yes, it has been for Anchor and Proposal.

### Adjustment at a slice level (TEncSlice.cpp line 156 – 173.)

```
for(UInt compIdx=1; compIdx<MAX_NUM_COMPONENT; compIdx++)
{
    const ComponentID compID=ComponentID(compIdx);
    Int chromaQPOffset = slice->getPPS()->getQpOffset(compID) + slice->getSliceChromaQpDelta(compID);
    Int qp=(iQP + chromaQPOffset < 0) ? iQP : getScaledChromaQP(iQP + chromaQPOffset, m_pcCfg->getChromaFormatIdc());
    Double tmpWeight = pow( 2.0, (iQP-qp)/3.0 ); // takes into account of the chroma qp mapping and chroma qp Offset
    #if SCM_S0086_MOVE_ACT_FLAG_TO_PPS
    if(m_pcCfg->getRGBFormatFlag() && slice->getPPS()->getUseColourTrans())
    #else
    if(m_pcCfg->getRGBFormatFlag() && slice->getSPS()->getUseColourTrans())
    #endif
    {
        tmpWeight = tmpWeight*pow( 2.0, (0-map[iQP])/3.0 );
    }
    m_pcRdCost->setDistortionWeight(compID, tmpWeight);
    dLambdas[compIdx]=dLambda/tmpWeight;
}
```

### Further adjustment at a block level (TEncSearch.cpp line 2533–2534, 2649–2650, 8456–8457, and 8789–9790.)

```
...
m_pcTrQuant->adjustBitDepthandLambdaForColourTrans(compID==COMPONENT_Cr? DELTA_QP_FOR_YCgCo_TRANS_V: DELTA_QP_FOR_YCgCo_TRANS );
m_pcRdCost->adjustLambdaForColourTrans(compID==COMPONENT_Cr? DELTA_QP_FOR_YCgCo_TRANS_V: DELTA_QP_FOR_YCgCo_TRANS );
...
```



# Conclusions

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- a) PSNR between components is becoming more unbalanced?
  - No
- b) YCoCr is more frequently used?
  - No. The use of negative QP offset results in less YCoCr choice.
- c) Local PSNR becomes different dependent on ACT choice?
  - Unknown since local PSNR varies by the other factors.
- d) Perform visual inspection
  - Visual difference was observed at high QP results.
- e) Lambda setting has been adjusted depending on the QP change?
  - Yes

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